

conducting wires or electrodes. The inner end of this tube is closed by a flat keel of solid glass, but the wires pass through this into the upper part of the bulb, where they are connected by an electrotype of copper to a fine loop or arch of carbonised woody fibre cut from the silicious skin of the bamboo cane. Mr. Edison exhibits specimens of bamboo from China, Japan, and South America, as well as fibres from Brazil, which he has tested in seeking a good and durable carbon for his lamp. He shows also a number of samples of the carbonised loops made by simple charring in a crucible or by treatment after the Berthollet process, as well as loops of pure graphite very carefully cut. What the particular bamboo is that he has finally adopted we have never been able to learn, but it is probably a variety of the "Shikakuahikee" of Japan, which yield a very close and even skin. The carbon loop is about  $2\frac{1}{2}$  inches high, and 1 inch wide, and is so fine that its electric resistance is about 100 ohms. in the "16-candle lamps," and about 50 ohms. in the 8-candle lamps. All the lamps at the Crystal Palace are plain single loop lamps; but sometimes Mr. Edison combines two or more loops, as shown in Figs. 4 and 5. These loops can either be coupled up "in series," or "quantity," and

instead of making the loops plain they may be curled into a spiral form. The air being exhausted from the bulb there is no oxidation of the carbon after a short time and Mr. Edison claims that his lamps will last 1000 hours. This at an average rate of between three and four lighting hours per night would give a life of nine months to each lamp; but the estimate may be found a little partial in practice: for though the carbon does not burn, it is doubtless slowly dissipated by the wasting action of the gases and the energy of the current. As Mr. Edison claims to make the lamps at a shilling each, their durability is not so very important as it might at first appear. The Edison dynamo electric machine consists of two vertical electromagnets inclosing between their lower pole pieces of soft iron, a revolving armature. In the armature the usual coils of insulated wire are replaced by longitudinal bars of copper of trapezoidal section insulated from each other by brown paper. These bars are connected to the slips of the commutator in such a manner as to give a continuous circuit through the bars and a continuous current to the brushes when the armature revolves. The main conductor conveying the current from the machine consists of a solid rod of copper in

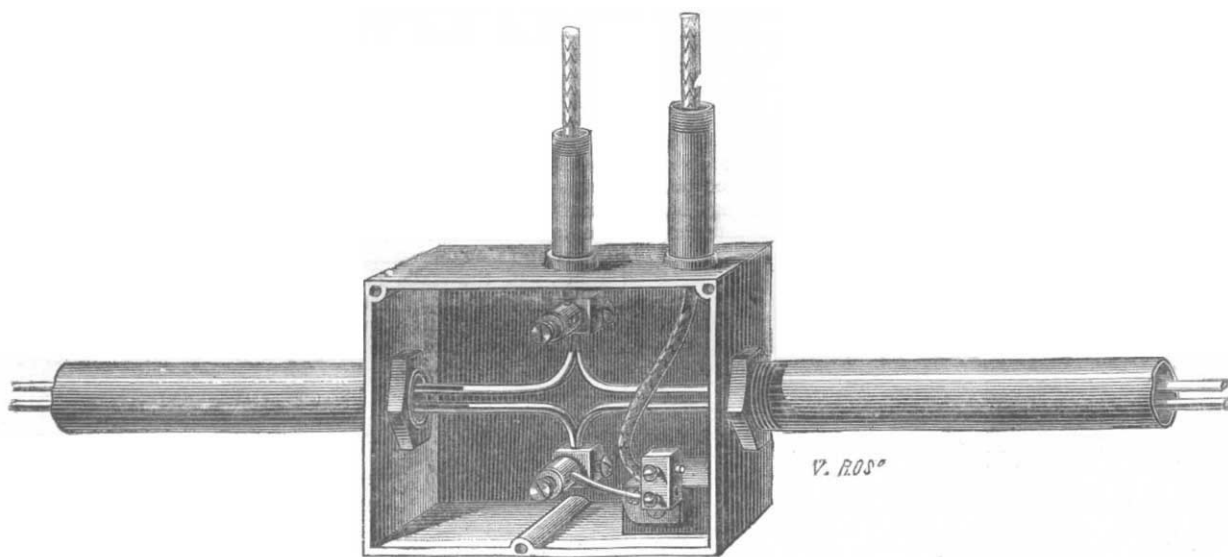


Fig. 6.

cross-section, like a segment of a circle. Two of these rods, the outgoing and return wire, are inclosed a little apart in the same iron pipe and insulated by a black compound resembling Thomson's wax. Branch-conductors in the form of cables for side-streets are connected to the mains in a joint-box shown in Fig. 6. This consists of an iron box in which the mains are connected to two iron terminals. One branch cable is connected to one of these terminals direct, and the other through a short piece of lead to the other terminal. The lead acts as a safety-valve in fusing if the current is too powerful. The box is hermetically sealed, to keep the inside dry. The conductors led into the houses are of a still smaller size, having a diameter of from two to three millimetres; but throughout the whole system the going and returning wires keep together, and the lamps are simply connected across between them. In each lamp, too, there is a similar safety connection of lead to protect the carbon if the current is too strong.

The incandescent system has evidently been brought to great perfection by Mr. Edison, backed as he is by plenty of capital and skilled assistance. Although the idea of it is not new, and was patented in England by Mr. Starr in 1845, Mr. Edison deserves great credit for

working it out in so practical a form. Starr described a vacuum bulb of glass containing a thin rod of carbon rendered incandescent by the passage of the current, and Mr. Edison found in this the rough pebble which he has cut and polished with so much success. Moreover, he saw the merits of the incandescent system for domestic lighting at a time when other electricians were giving all their attention to the arc light; and therein showed his genius and foresight. For it is evident now to electricians that while the arc light is well enough adapted for the lighting of large areas, it is unsuitable for small interiors. The practical success of Mr. Edison's system is not thus far a complete justification of his early promises, for the cost is still an unknown quantity, as far as the public are concerned, and there are strong reasons for believing that it will not nearly be so low as the startling figure held out in 1878.

#### NOTES

At the annual meeting of the Geological Society the medals were presented as follows:—The Wollaston Gold Medal to Dr. Franz Ritter von Hauer, Director of the Austrian Geological Survey; the Murchison Medal to Prof. Jules Gosselet, of Lille;

the Lyell Medal to Dr. John Lycett, of Scarborough; the balance of the Wollaston Fund to Dr. G. J. Hinde; the balance of the Murchison Fund to Prof. T. Rupert Jones; a moiety of the Lyell Fund to Prof. Charles Lapworth, Mason College, Birmingham, and to the Rev. Norman Glass; a portion of the proceeds of the Barlow-Jameson Fund to Baron Constantin von Ettingshausen, Professor of Botany at Graz. Mr. J. W. Hulke, F.R.S., was elected President, in succession to Mr. Etheridge.

THE Rev. Thomas Romney Robinson, D.D., died on Tuesday, after a short illness, at his residence, The Observatory, Armagh, at the patriarchal age of eighty-nine years. He retained his mental faculties in surprising activity and vigour to the last.

M. DESOR, one of the last companions of Agassiz in his great Alpine excursions, which led to the discovery of the theory of glaciers, has just died in Neufchatel. M. Desor, although born in Germany, was of French extraction, and had been a naturalised Swiss citizen, and became the president of the National Council. He bequeathed all his fortune to the city for scientific purposes.

DR. W. R. HODGKINSON, Senior Demonstrator at the Royal College of Chemistry, has been appointed to the Professorship of Chemistry and Physics at the Royal Military Academy, Woolwich.

PROFESSORS ROSCOE AND ABEL, as presidents respectively of the Chemical Society and Institute of Chemistry, will hold a reception on the 22nd inst. at the Crystal Palace in connection with the Electric Exhibition.

THE Sanitary Institute is to hold an Exhibition of Sanitary Apparatus and Appliances at Newcastle-on-Tyne, this year, from September 26 to October 21, in connection with the fifth Autumn Congress of the Institution.

ON April 18 next a Congress of Greek physicians and naturalists from all parts of the world will meet at Athens.

THE International Congress for Ethnographical Sciences, called together by the Paris Ethnographical Institution (founded 1859), will meet at Geneva on April 10 next under the presidency of M. Carnot. Besides all the European States, India, Egypt, Japan, Canada, the United States, the Argentine Republic, and Australia will be represented. The Institution includes amongst its main objects the facilitation of the personal intercourse between men of science of all countries, and also the support of exploring travellers. All information regarding the Congress is furnished upon application by M. G. Becker, Lancy, near Geneva.

WE learn from No. 13 of the Johns Hopkins University Circulars (February, 1882) that Prof. Cayley, F.R.S., has commenced residence as Lecturer in Mathematics. He read a paper at the January meeting of the "Mathematical Seminary" entitled "On Two Cases of the Quadric Transformation between Two Planes."

WHILST this winter has been remarkably mild in Western Europe, it has been of quite unusual severity in South-Eastern Russia. The main chain of the Caucasus is covered from the top to the lowest valleys with snow. The great depression of the Kura and Araks rivers looks like a Siberian plain covered with snow. The bright sun of the south seems unable to warm the cold soil, and in the night the small streams and irrigating channels freeze. Even the Mikhael Gulf of the Caspian, south of Krasnovodsk, was frozen from December 19 to January 7, and the thickness of the ice was  $4\frac{1}{2}$  inches.

COLONEL BRINE and Mr. Simmons started on Saturday morning from Canterbury in their balloon trip across the Channel, the wind being considered favourable. After getting

about thirteen miles out from Dover the aeronauts discovered that the wind backed to the south-west, and thinking discretion the better part of valour they lowered their car into the sea and were picked up by a passing steamer, after having been in the air for about three hours.

INSTEAD of allotting the surplus from the Electrical Exhibition to the new School of Chemistry and Physics, M. Cocherly has kept it for the establishment of a laboratory of electricity, which will be under his administration.

A COMMITTEE is being formed at Neuss on the Rhine, with the view of erecting a monument to the late Dr. Theodor Schwann, in the public gardens of that town. Dr. Schwann, as our readers will remember, was a native of Neuss.

THE February number of *Naturen* contains an interesting notice of the changes of movement observable in the Norwegian glaciers, which, as is proved by well-attested local records, have repeatedly advanced and receded within the last two centuries. It would appear that the vast system of the Jostedal glaciers has been especially affected by these variations, for here, where the ice has been diminishing since 1750, it had previously been advancing so rapidly, that in 1742 the local magistrate was summoned by the occupants of a hamlet known as "Ni Gaard," Nine Farms, to inspect the damage that was being done, and to grant them remission of their taxes on such lands as no longer admitted of cultivation. The official report states that the glacier had then approached within one hundred ells of the nearest farm, and that in the following year the buildings were thrown down and crushed under the advancing masses of ice. Gradually the other farmsteads disappeared, leaving nothing but the name of the spot to attest that it had once been cultivated. Since this period the Jostedal glaciers generally, have been retreating, a fact which was first noticed by Prof. Smith, of Upsala, who, writing in 1817, draws attention to the milder winters which in Scandinavia had characterised the latter half of the last century, while the years 1740-42, which succeeded several hard winters and bad summers, had been so especially inclement that they are known in Norway as the "Green years," from the unripe condition of the corn. This period coincides with the date of the devastations of the Nigard glacier which, after a prolonged process of diminution has, according to De Seue, been again steadily advancing since 1869. The Folgefon glacier, near the Sörfjord has, as we learn from the report of Sexe, who visited it in 1864, been subject to similar alternations. At the present time it is advancing, its extremity having between 1860 and 1878 been projected 40 metres further forward, bringing it within 200 metres of cultivated fields.

THE meteorological report of the weather in 1881, as observed in Christiania, exhibits the same anomalies that have been recorded in other countries. Notwithstanding periods of exceptionable mildness, the mean annual temperature was  $1^{\circ}$  R. lower than the normal. The highest temperature ( $20^{\circ}4$  R.) was recorded on May 31, the lowest ( $-18^{\circ}7$  R.) on January 14. In November and December the temperature was higher than usual, the excess amounting in the latter month to  $3^{\circ}6$  R., which was largely influenced by the abnormal heat of December 28, when the thermometer at noon marked  $9^{\circ}4$  R., a temperature that has never before been reached since the opening of the observatory in 1837; while since 1857 the mean for December had not risen above the freezing point. The rainfall was marked by equally great irregularity in the manner of its distribution, only 5 millimetres being recorded for April, and 102 for August, the former being  $19\cdot3$  mm. below the average, and the latter 24 mm. above it.

A SERIES of scientific lectures in Chinese to the Chinese schools in Peking, commenced by the American mission, is said



to be attracting wide attention in the Capital, and to have drawn large audiences. Two of the course have already been delivered; the first by Dr. Edkins, the well-known Sinologist, on astronomy, and the second by Dr. Dudgeon, head of the Missionary Hospital at Peking, on the heart and circulation of the blood. Both lectures were copiously illustrated by the magic lantern. It is gratifying to find the missionaries, who are among the small number of people capable of teaching the Chinese in their own language, working thus for the spread of elementary western knowledge amongst the Chinese.

AT the ordinary meeting of the Meteorological Society, to be held at 25, Great George Street, Westminster, on Wednesday, the 15th inst., at 7 p.m., there will be an Exhibition of Anemometers and of such new instruments as have been invented and first constructed since the last Exhibition. During the evening the President, Mr. J. K. Laughton, M.A., F.R.A.S., will give a historical sketch of the different classes of Anemometers, and will also describe such forms as are exhibited.

ACCORDING to the *Annales de l'Extrême Orient*, at the commencement of the year there were in Japan 3929 miles of telegraph line with 9345 miles of wire. The telegrams sent during the year numbered 1,272,756, of which about 96 per cent. were in Japanese, while there were 22,695 international messages. A school of telegraphy has been founded in the capital, the pupils receiving a practical knowledge of English and French. During the year this institution sent 227 young men out to the various telegraph offices. The average cost of sending twenty words in Japanese for a distance of sixty miles is about three *sen*, or one penny, taking as a basis of calculation the line from Tokio to Nagasaki. The average for shorter distances is much greater, being about seven *sen* from Yokohama to Tokio, a distance of only twenty miles. There were 112 offices open to the public, and 70 attached to departments of State, the police, &c.; 53 remained open night and day; 848 Morse instruments were in use at the end of the year, and 29 Bell's telephones.

A VIOLENT earthquake is reported from Tongatabu in the Pacific on November 24 last. The whole island was so shaken that it was almost impossible to remain standing erect. A strong earthquake shock, which lasted twenty seconds, was felt at Bellinzoni, Olivone, and other parts of the Canton of Lesser, Switzerland, on February 27.

THE Russian botanist, M. Smirnoff, who is now in Turkestan, writes to the Russian Geographical Society that the vineyards of the country are quite destroyed by the small parasitic fungus *Erysiphe*. He says that he never saw such a dreadful and widely-spread destruction of vineyards as he witnessed in Turkestan. It can only be compared with the destruction by a heavy hail-storm.

HERR HAKONSON-HANSEN draws attention to a remarkable phenomenon due to refraction, observed by him at Trondhjem, on January 17, and similar in all respects to one witnessed by him at the same place on November 15, 1881. On both occasions, at 2.50 to 3 p.m. in the day, a rose-coloured stripe was seen to stretch across the sky from about north-west to east. From the middle of this rose a vertical column of a somewhat lighter red colour, and inclining on its western side to a shade of yellow, the whole being intensely luminous. After remaining visible for about ten minutes, the bright reds and yellows gradually faded away, leaving nothing but a blackish gray streak across the heavens. The sudden and striking apparition of this vertical column recalled, as Herr Hansen observes, the descriptions given in past ages of bloody crosses seen in the heavens, and regarded as prophetic of coming wars and pestilence, and he remarks that if it had been seen at a later period of the day, it might have been taken to be a specially brilliant aurora.

STEAMERS recently arrived at New York report that they encountered immense fields of ice in lat. 45° 48' N., long. 47° 48' W. The *Circassian* had to steer south two days to clear them, and the *St. Germain* was fast for seventeen hours in the same pack.

M. SALIGNAC, one of the most active electricians of Paris, has discovered a new regulator which will be one of the curiosities of the next *grande soirée* given at the Observatoire on the 13th inst. Each of the two carbons is supplied with a parallel rod of glass, to which it is attached in a solid manner. These two rods being placed horizontally, are pushed by a spring, and the spark is lighted between them. But between the two glass rods there is a glass stopper which is warmed by the light in such proportion that the rods yield gradually to the pressure of the springs, and the carbons can approach each other, as is required for the constancy of illumination. Our correspondent witnessed preliminary experiments which he states have been a wonderful success.

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus* ♂) from India, presented by Mr. G. Richardson; a Common Peafowl (*Pavo cristatus*) from India, presented by Mrs. Walter Crane; a Greater Sulphur-crested Cockatoo (*Cacatua galerita*) from Australia, presented by Mr. S. Sidney; a Common Jay (*Garrulus glandarius*, white var.), British, presented by Lieut.-Col. Birch Reynardson; twelve Pink-lipped Snails (*Helix hamastoma*) from Point de Galle, Ceylon, a nest of Cocoons from Kadur District, Mysore, presented by Mr. J. Wood Mason; a Four-horned Antelope (*Tetracerus quadricornis* ♀), born in the Gardens.

#### OUR ASTRONOMICAL COLUMN

THE VARIABLE STAR U GEMINORUM.—The following interesting note upon a recent maximum of this apparently capricious variable, is by Mr. G. Knott, who writes from Cuckfield on March 6:—"On February 20 I noted it 13.7m. At intervals it seemed to flash out brighter, and there was every indication of a probable rise to maximum. Clouded skies night after night prevented my observing again till March 1, when in a clear interval of short duration I found U, 9.7 mag. *Disk large and ill-defined*. I have observed it since as under:—

March 2	...	9.9m.	Light rather unsteady. Colour, white or bluish white.
"	3	...	10.1m. Bluish white.
"	4	...	10.5m.

I suppose we may take the maximum to have fallen *not later* than February 28.

The previous maximum observed by me fell on April 3, 1881, the interval in days being 331, which would give 110 days as the period, if we suppose three maxima to have occurred in the interval. The period appears to vary between 75 and 126 days. The star appears to form a kind of connecting link between the *ordinary variable* and the so-called *new stars*, and as the causes which presumably underlie the phenomena are *physical* rather than *geometric*, perhaps we ought not to be surprised that the period has a wide and somewhat irregular range. *The star is a most interesting one.*

It is due to Mr. Knott to add that so far as the published observations of variable stars elsewhere enable us to judge, he has been much more successful than other observers in following the maxima of this difficult variable of late years; such success could only result from very assiduous and careful observation.

THE TOTAL SOLAR ECLIPSE OF MAY.—By way of reply to several inquiries as to the most probable track of the central line in the eclipse of May 16, we subjoin the following points which have been interpolated down from those given for five-minute intervals in the "American Ephemeris." As already remarked in this column, the difference in the place of the moon employed in that work, from Hansen's place, happens, on this occasion, to correspond very closely with the amount of Prof. Newcomb's empirical correction of Hansen's Tables, and hence the path